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ABSTRACT

New Mexico's teenage pregnancy rate ranks third in the nation. Among New Mexico's teenage women, birth rates are 31% higher than the national rate for the 15 to 17 age group and 30% higher for the 18 to 19 age group. The New Mexico Survivorship Study, a longitudinal investigation being conducted in an effort to reduce these figures, uses the technique of survivorship methodology from epidemiology. In biomedical investigations that use survival analysis, patients with a lethal disease are followed over time until they die. Factors associated with greater survival times are then used to design more effective treatments. In the New Mexico Survivorship Study, this technique is being adapted to study teenage pregnancy. Beginning in the fall of 1993, teenage women (N=1,894) will be tracked over a risk period (7th through 12th grade) for a designated outcome (pregnancy) and those variables related to survival time will be examined statistically. School nurses at study sites will interview students who became pregnant (nonsurvivors). Matched control students who do not become pregnant (survivors) also will be interviewed. As a preliminary step, records from the past 5 years were accessed to establish some approximation of baseline incidence. The New Mexico Survivorship Study hopes that, by drawing information on etiology directly from young women who become pregnant, prevention mechanisms can be designed that will reduce the state's ranking in teenage pregnancies. (Contains 23 references.) (NB)

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Tracking Survivors Through the High School Years : The Theory of Survival Analysis

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The United States has one of the highest rates of teenage childbearing in the developed world (1). One million teenage pregnancies occur annually in the U.S. (2). In 1986 more than 40% obtained abortions and over 470,000 gave birth ,with 38% of those births to women 17 years or younger (3). One 1988 study found almost a half million teens gave birth and one fourth of these births were to teens who already had children (4). Ironically, however, the absolute number of births to 15- to 19-year olds has been decreasing nationwide since the early 1970s. The proportion of all U.S. births which are accounted for by teenage mothers has also declined,slowly,in the 1980s (5). Essentially these latter patterns are a function of a shrinking teenage population base, a declining teenage birth rate,
as well as an increase in births in general as the baby boom generation approached its third decade (6).

There is a wealth of data on natality parameters related to teenage pregnancy from vital statistics both at the state and national levels. There is also substantial literature examining the wide array of causative factors in teenage pregnancy (7,8). While much of this inquiry has proved to be excellent examples of convergent and cumulative social science research comparable data on minority populations has unfortunately lacked (9,10).

A recent study of teen births in a poor urban environment (Baltimore) by Hardy and Zabin in 1991 for example found that the proportion of all births accounted for by births to teeenagers was 26 percent (11). This figure is more than double the national proportion. Trends in poor urban centers have never been and are still not encouraging. The pregnancy rate for 14- to 17-year olds in Baltimore continued to increase in the 1980s. In 1990 the New York Times reported on research by the Maryland Department of Health showing that the mean age of the men who impregnated young girls was over twenty years of age. While the birth rate for older teens may have declined marginally in recent years, for the youngest adolescent group it has not. Such horrific data indicate the need for continued cohort analysis if trends are to be understood and efficacious interventions designed (12). Additionally these data demonstrate the need for comparable investigations in nonurban areas of the country where teen pregnancy is also a major public health concern.

New Mexico is the fifth largest state in the nation yet is sparsely populated. It is by demographic composition alone the nations most ethnically diverse state. New Mexico's teenage pregnancy rate ranks third in the nation (13). Among New Mexico's teenage women,birth rates are 31% higher than the national rate for the 15 to 17 age group and 30% higher for the 18 to 19 age group (14).

Too few strategic, longitudinal investigations are underway to reduce these figures. The New Mexico Survivorship Study is designed to help with this formidable task using techniques from epidemiology,specifically, survivorship methodology.

METHODS

Concept of Survival Estimates

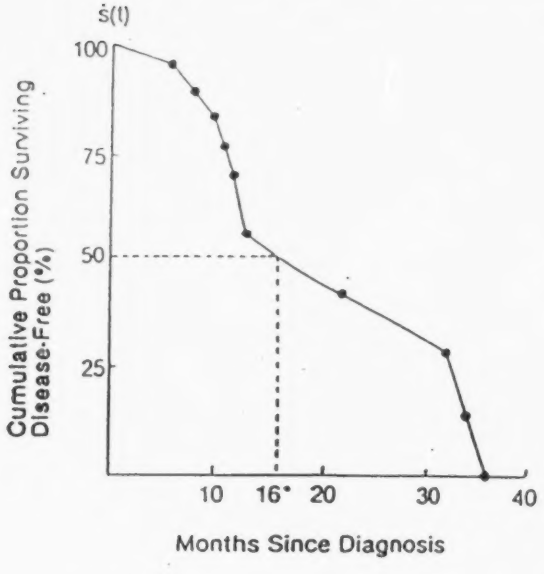
In various biomedical investigations that utilize survival analysis patients with a lethal disease are followed over time until they die. Factors associated with greater survival times are subsequently used to design more effective treatments. The cumulative time period for such a study is normally divided into intervals (ie, years) from which resultant probabilities of surviving are calculated. For example, Seage and colleagues (15) estimated survival times for AIDS patients in Massachusetts 1979 to 1989. Not surprisingly, patients who were diagnosed earlier reported greater survival times than those diagnosed later after appropriate confounders were controlled ($p < .001$). Survivors are operationalized as those who are alive at the start of a time interval and are <u>still</u> alive at the end of the interval. The survival rate thus becomes :

$$S(r) = 1 - \text{Cumulative Death Rate}$$

Moreover the probability of surviving each successive interval can be estimated as can the probability of surviving to to the end of the study (16).

Figure 1 portrays a survival curve estimate for subjects in a osteosarcoma study. In many survival studies median survival lines are calculated to portray where in time one half of the subjects have survived to. Such data is of critical importance to those responsible for designing cost effective care and treatment of patients.

FIGURE I
SURVIVAL ANALYSIS

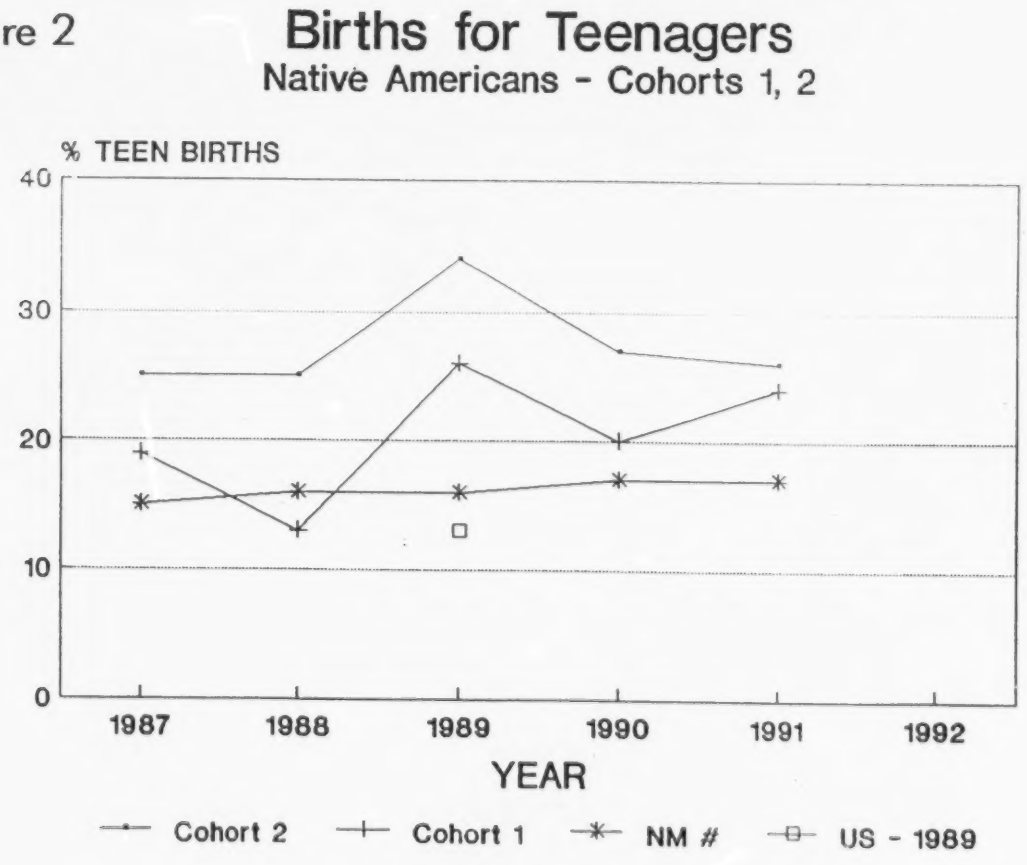


*Median Survival Time.

While data on teenage birth incidence in New Mexico is available expressed both as a rate and/or as a percentage of total births for brevity only percent teen births of total births is used. This expression is congruent with much of the vital statistics data published annually by the New Mexico Department of Health (22).

For purposes of comparison state data on percent teen births and comparable national data is presented (Figure 2)

Figure 2



Application

We have adapted this technique to the problem of teenage pregnancy in New Mexico. In concert with survivorship methods we will track subjects N=1894 (ie,teenage females) over a risk period (ie,7th through 12th grade) for a designated outcome (ie,becoming pregnant) and examine statistically those variables related to survival time (ie,risk v. protective factors). School nurses at the study sites will conduct interviews with each young woman who becomes pregnant as part of their routine workload. Matched control students will also be subsequently interviewed using the identicle interview guide. The interview guide was developed from literature (17) and deliberations from a series of parallel expert panels (18) drawn from both study sites . After four revisions and a cross validation by teachers from a nearby school for pregnant teenagers the final instrument evolved. Data will be analyzed with the STATA and SAS statistical analysis packages (19). A proportional regression hazards analysis will be used to identify variables associated with survival. Prevention strategies can then be instituted from this data to accentuate "survival" time . Concurrently data should delineate which variables are placing young women at greater risk for pregnancy . This information will help in the design of programs that wish to attenuate potent risk factors.

Historical Baseline Data

Due to the nature of the data collected and the strategy of this type of research survivorship studies are normally prospective (cohort) investigations. Subjects are entered into the data base at the start of the project period and followed until the predetermined end of the study. Beginning in the Fall of 1993 students at schools in two geographically separate counties in New Mexico will be given anonymous identification codes and entered into the data base. In the western county there are two cohorts that will be tracked. One of these is a native american high school sample (N= 297) while the other is a high school with equal proportions of native american, hispanic and white students (N= 997). In the northern county a largely hispanic/white population will be tracked (N=600). Since we will not be able to collect data (incident pregnancies) until the start of the 1993 academic year we have constructed retrospective data from the native american sites using available school and public health nursing records. Such historical retrieval allows for a sounder view of the starting point from which preventive efforts may ultimately be evaluated (20,21). We accessed records from the past five years to establish some approximation of baseline incidence.

RESULTS

Table 1 presents the data for the years 1987 through 1991 for the native american (western) site only. Data for the hispanic/white (northern) is in the process of being reconstructed so as to be comparable to the native american records. The native american data is presented according to tribal affiliation even though students from the two main tribes attend the same high school. This is shown by the subscripts 1 and 2.

The percent teen births ranges from 12.7 % in 1988 for cohort 1 to 34.4 % in 1989 for cohort 2. Overall the proportions are well above the state as a whole (15-16%) and well above the national figure (12.7%). While fluctuations are apparent between the tribes, specifically 1988, the proportions themselves are strikingly high.

Figure 3 gives a more global view of the teenage pregnancy dilemma in New Mexico. When data is examined for the 1980 to 1991 period and New Mexico Indian are compared to New Mexico Non-Indian on percent teen births, some degree of convergence between the estimates begins around 1987 and continues to 1991.

TABLE 1: BIRTHS TO TEENAGERS - NATIVE AMERICAN COHORT $_{1,2}$ 1987-1992

YEAR	# BIRTHS TOTAL	# TEEN BIRTHS	% TEEN BIRTHS	FREQ DISTRIBUTION BY AGE
1987_1	70	13	18.6	15 - 2 16 - 6 17 - 3 18 - 2
1987_2	49	10	24	15 - 1 16 - 2 17 - 5 18 - 2
1988_1	47	6	12.7	15 - 2 16 - 1 17 - 2 18 - 2
1988_2	48	12	25	14 - 1 15 - 2 16 - 2 17 - 1 18 - 6
1989_1	70	18	25.7	14 - 1 15 - 3 16 - 3 17 - 2 18 - 9
1989_2	64	22	34.4	13 - 1 14 - 2 15 - 3 16 - 10 17 - 2 18 - 4
1990_1	80	16	20	15 - 4 16 - 3 17 - 6 18 - 3
1990_2	70	19	27	14 - 1 15 - 2 16 - 5 17 - 4 18 - 7

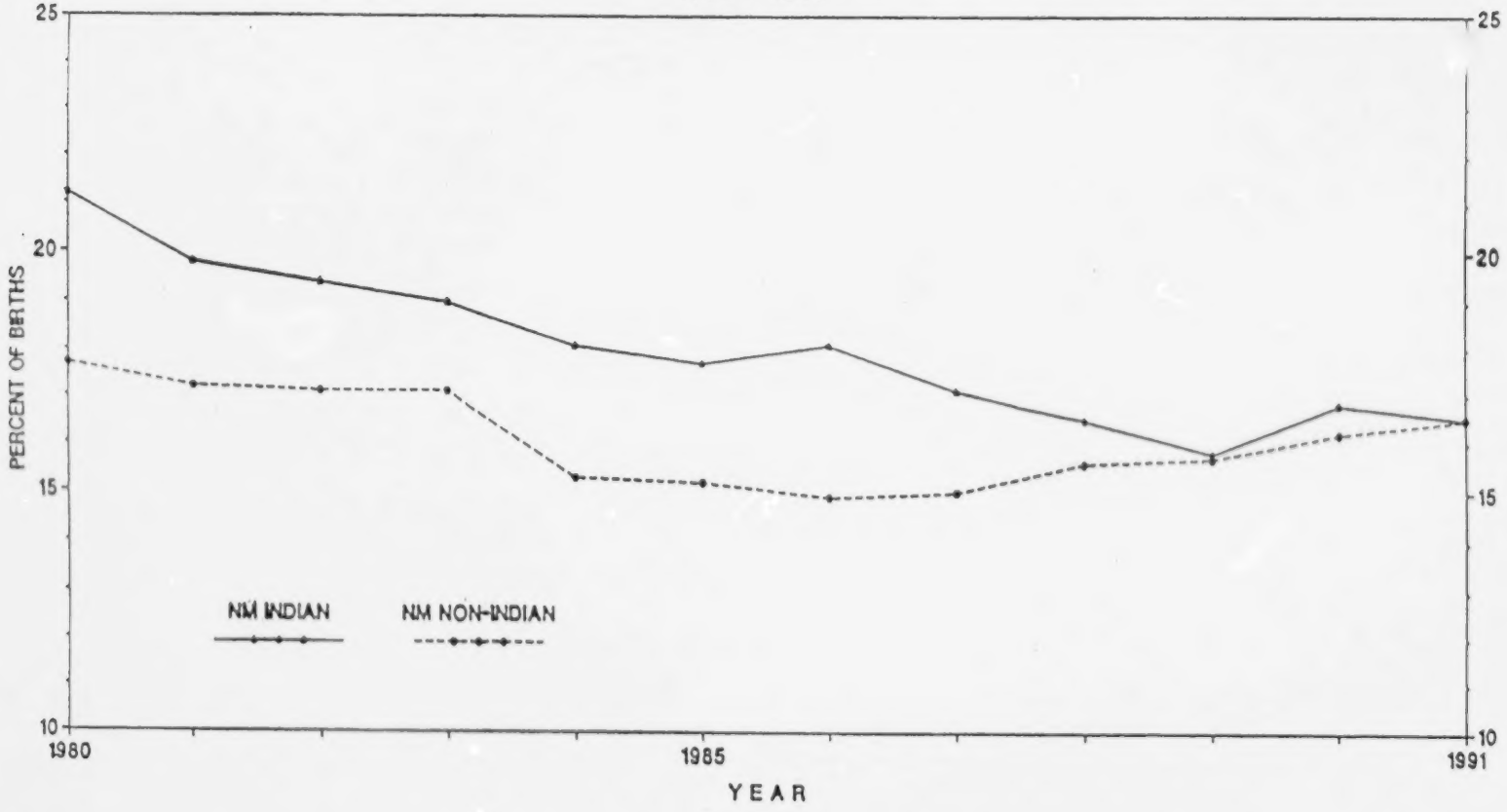
TABLE 1: BIRTHS TO TEENAGERS - NATIVE AMERICAN COHORT [1, 2] 1987-1992 (cont'd)

YEAR	# BIRTHS TOTAL	# TEEN BIRTHS	% TEEN BIRTHS	FREQ DISTRIBUTION BY AGE
1991_1	67	17	25	14 - 1 15 - 4 16 - 3 17 - 5 18 - 7
1991_2	75	17	23	14 - 1 15 - 2 16 - 4 17 - 6 18 - 4

1, 2 Refer to different tribes

FIGURE 3

PERCENTAGE OF BIRTHS TO TEEN MOTHERS
NEW MEXICO RESIDENTS
1980 - 1991



DISCUSSION

We have designed a longitudinal survivorship study of teenage childbearing in two New Mexico counties where teenage pregnancy is considered unacceptably high. An anonymous tracking system is now place which will enable our research team to collect data from both those who become pregnant (nonsurvivors) and matched controls who do not (survivors). This information will then be used collaboratively by school nurses,health educators , school officials and the research team members to develop more relevant and effective prevention initiatives and programs at the specific sites.

Retrospective data on the incidence of teen pregnancy (native american site only) was retrieved from public health records to establish an historical starting point for the project.

In a recent paper, Mueller and Higgins (23) reviewed programs for the prevention of an array of adolescent problems,including pregnancy. Several factors were proposed as correlates of program effectiveness. None of the recommnedations addressed the use of epidemiological techniques such as survivorship in the amelioration of these various problems.

Each of the recommnedations, however, are readily subsumed under the proposed survivors study described here for New Mexico. The unique cultural heritage, linguistics and topography of New Mexico make behavioral prevention efforts extremely challenging. Any external overature to change the social or health-related behavior of the indigenous population is continually at risk of offending and thus isolating the targets of the proposed intervention. The literature in the area of sexuality education and prevention contains some of the most sensitive and emotional material in the sociobehavioral sciences. The practical application of survivorship methods from the discipline of epidemiology to teenage pregnancy facilitates acceptance and active participation in the program due simply to the fact that information on etiologic variables is drawn directly from the target population itself. Moreover this information is collected by trusted and accepted individuals from the communities themselves (school nurses).

It is evident that pregnancy prevention initiatives ongoing over the past decade in New Mexico have had considerable difficulty reducing the magnitude of this problem in the designated sites. As Figure 2 suggests ,however, there has been success in reducing the gap between Indian and Non-Indians in percent teen births.

Exemplary programs in human sexuality and reproductive health education have been ongoing throughout the state and both these counties for some time. An innovative teen health clinic with contraceptive access has been in operation for over five years in both sites. Still the aberrant rates of teenage pregnancy persist. The New Mexico Survivorship Study hopes to draw information on etiology directly from young women who become pregnant and eventually have in place prevention mechanisms that will reduce the states ranking in this important public health area.

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